THE VETERINARY RECORD

A Weekly Journal for the Profession.

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No. 1167. NOVEMBER 19, 1910 VOL. XXIII.

AN INDIAN CAVALRY SCHOOL.

In *The Army and Navy Gazette* of the 12th November there is an article by "Our Correspondent" on the cavalry school which has recently been opened at Saugor, Central Provinces, India. It appears that at this school officers and non-commissioned officers of the British and Indian Armies are being taught veterinary subjects wedged into a course with equitation, including proficiency and power of imparting instruction in riding and in the breaking and training of horses for military purposes; skill at arms; horse management; strategy and tactics; rapid appreciation of situations and the writing of orders; practical exercises in field reconnaisance, despatch riding, intercommunication, and operations of cavalry in co-operation with the other arms; military engineering as affecting cavalry, and sanitation.

After giving this outline of the course of study, which extends only over eight months, the writer goes on to say, "Students should thus be able during their course, in addition to getting a certificate as having passed the course at this school, to gain a knowledge of veterinary subjects, and pass in military engineering in the same way as is done at the School of Military Engineering at Chatham, and to pass in sanitation, which is one of the subjects included in the promotion examination. This would have a great advantage in the eyes of the commanding officers, who would only lose the services of their subaltern officers for this eight months course, in which they could obtain three or four certificates, and are made into efficient instructors."

We do not profess to express an opinion as to the value which can be attached to the other certificates to be obtained, but we are quite certain that the time which can be given to the teaching of veterinary subjects must result in the acquirement of a little and dangerous knowledge. Apparently the same opinion has been forced upon the authorities, because we are told that one drawback to the school curriculum is, that the veterinary officer lives 200 miles away, and only visits Saugor once a month for three days, thus preventing the students from obtaining proper instruction in veterinary subjects and passing a veterinary course while at school.

During the recent Army manœuvres in the South of England, we heard a great deal regarding the inefficiency of our Army, which was chiefly attributed to the superficial training and make-believe on the part of the officers. Can this be wondered at if the Cavalry School at Saugor is a type of how Army instructors, and presumably authorities on the subjects they profess to teach, are turned out. We congratulate our military *confrères* in not being in this instance party to a make-believe.

ON ALTERED TYPES OF DISEASE AND MODERN IDEAS OF TREATMENT.

By E. WALLIS HOARE, F.R.C.V.S.

In the present day one hears the remark that certain diseases have altered in their characters. A little thought may enable one to decide whether there is a grain of truth in the suggestion or otherwise.

No doubt individuals who believe that every disease possesses a classical set of symptoms, the latter being as unalterable as the laws of the Medes and Persians, are hardly likely to enter into a discussion which may rudely shake their implicit faith, or lead them to accept unorthodox views. On the other hand, those who admit the possibility and probability of errors in diagnosis, and who confess how little they really know with reference to even common-place diseases, will conclude that the subject is worth consideration.

The crucial point to decide with reference to altered types of diseases is whether such types were not always in existence, but were overlooked, or erroneously ascribed to other affections.

Take for example canine distemper. It is not uncommon to hear that the type of this disease has altered, the reason adduced being that cases showing the time-honoured classical symptoms of catarrh of the nasal passages and conjunctivæ, are by no means so numerous as those occurring with an absence of these symptoms. A little reflection, however, will explain the matter, at any rate to a certain extent. A far greater number of cases of distemper are diagnosed in the present day, because practitioners have learned that a discharge from the eyes and nostrils of the affected animals is not an essential symptom. This being so it follows that cases showing the catarrhal symptoms mentioned will be fewer in number as compared with other types of the disease.

Much has been learned of late years with reference to the clinical aspect of distemper and one result of this knowledge is that early isolation of cases is secured. Another is that cases are treated earlier, and thus exposure to cold and chills is prevented. A more rational line of treatment is also adopted, the heroic measures of former days being now abandoned.

It must be confessed, however, that some practi-

tioners still hold antiquated notions with reference to distemper, the result being that many cases of the disease are overlooked and irrational treatment adopted. An *unwise* scepticism is inimical to progress, and he who does not regard a case as one of distemper until he observes the presence of what he regards as classical symptoms of the disease, is not doing his duty to the animal or his client.

A medical man once made the remark to me that "any fool can say that a case is one of distemper," to which I replied, "that it is a far bigger fool who dogmatically asserts that a case is *not* one of distemper at his first examination of the animal.

Those who specialise in canine medicine have opportunities of observing cases which have been under treatment by other practitioners for various affections, but which prove without doubt to be cases of distemper that were not recognised.

Old customs and ideas die hard; the diagnosis of distemper according to antiquated ideas is a typical example.

Another disease which is said by some to have altered in its type is strangles. So many cases are now observed which do not show the so-called typical submaxillary abscess, that even the most hardened sceptic in questions of diagnosis is bound to admit the veracity of modern views on the subject.

But is it not likely that the various types of strangles were always in existence, but were overlooked, because practitioners depended on certain symptoms as essential to diagnosis?

Observation amongst a number of cases of strangles occurring on a farm will clearly demonstrate the various types this disease may assume. Formerly, those cases showing only symptoms of pharyngeal and nasal catarrh were not regarded as suffering from strangles, they were often said to have escaped it. We now know that such cases are capable of infecting other horses with strangles, and this will account for the mysterious outbreaks of the disease in town stalls when a new horse has been purchased suffering from what is described as a simple cold.

One peculiarity I have observed with reference to strangles recently is that a horse may be affected with very severe pharyngitis, and after a tedious course apparently recovers; after this he develops a typical strangles abscess in the submaxillary region and the original symptoms reappear. The rapidity with which the submaxillary enlargement occurs is surprising.

Are these cases to be regarded as strangles from the first, or as cases of influenza with a secondary infection of strangles?

Probably considerable temerity will be necessary to dogmatically assert that a given case of nasal and pharyngeal catarrh is *not* one of strangles in view of our present knowledge concerning the different types of the disease.

As an example of mistaking one of the types of a disease for a separate and distinct affection, we have the so-called scarlatina of the horse. Why it was ever termed scarlatina is a mystery, as it bears no resemblance to that disease in the human subject. A consideration of the clinical aspects of the disease and also of the suggestions put forward for its differential diagnosis, leads one to the conclusion that it is in reality one of the types of Purpura Hæmorrhagica.

Milk fever in cows would appear to show a greater number of mild cases than formerly, but one must take into consideration that in former times these mild cases were ascribed to other causes. Moreover the practitoner is generally called in earlier in the present day, and the owner does not adopt treatment which is likely to convert a mild attack into a severe and fatal one.

The more intelligent management of animals, and the fact that profeessional assistance is called in earlier than formerly no doubt exerts an important influence on the type of various diseases as regards severity and also fatal results.

Certainly we do not meet with so many cases of pulmonary gangrene following pneumonia, or of hydro-thorax, purpura hæmorrhagica, etc., as in former times,

Generally speaking, respiratory affections run a more favourable course in the present day, but it must be remembered that a more rational system of treatment plays an important part in this direction.

Polypharmacy and a deep-rooted belief in the virtues of drugs were much in evidence in the therapeutics of former days, and it might well be said that cases sometimes recovered in spite of the attentions of the practitioner.

Can it be said that in the present day this belief in the virtues of drugs does not exist? Judging by the enormous number of new drugs that are yearly put on the market, and by the fact that each of these receives testimonials with reference to the wonderful results obtained from their employment one is led to believe that the natural powers of recovery do not in the minds of many receive their due amount of attention or respect. Evidently the chemists who advertise these new remedies far and wide, take it for granted that amongst the ranks of practitioners, there are few who appreciate the remark of Benjamin Franklin: "He is the best doctor who knows the worthlessness of the most medicines."

The idea that because a certain agent is administered and the case recovers, the result should be attributed to the drug is a most unfortunate one for progressive medicine.

Before dogmatic assertions are made with reference to the therapeutic value of any agent, a long series of observations should be carried out and the results carefully compared with those obtained from the employment of other agents.

The success of the Schmidt treatment of milk fever was at one time attributed to the iodide of potassium which was injected; but, as the employment of air gives as good if not better results, we must doubt the therapeutical action of the iodide. When such simple treatment succeeds in a disease which formerly proved so fatal, who knows but what in the future simple measures will be discovered for other diseases that drugs are now believed to cure, or more frequently fail to benefit.

The craze for drugs that seems inherent in man-

kind, has much to do with indiscriminate prescribing. If a practitioner, having the courage of his convictions, does not prescribe drugs for a case in which he knows they are unnecessary, it is the exception to find that the owner of the animal is satisfied. Medicines they will have, of distinctive colour and smell, and if their fancy in this direction is not pandered to by the practitioner, the prescribing and dispensing chemist and the patent medicine vendor adds another name to their list of customers.

No doubt in the present day when unnecessary medicines are prescribed they are of a harmless nature, meriting the appellation of *placebos*. But supposing the public were educated in the rational uses and in the abuses of drugs, what a difference it would make from a commercial point of view!

When professional advice is valued at so low a price, and drugs skilfully got up to please the eye and so highly prized, would not that very important book the ledger show remarkable changes in the way of abridgment of accounts?

Recently a farmer client called and announced in a stentorian voice that he wanted *medicines* and *not* advice for a horse that was sick; a truly honest request, but really typical of the desires of many in this direction. One would almost be tempted to say like Iago—

"Work on, my medicine, work!
Thus credulous fools are caught."

But the implicit belief in drugs exist in some professional minds as well as in the minds of a credulous public. The self-satisfied egotistical individual who blindly imagines that he is infallible with regard to diagnosis, believes also that he controls the issues of life and death by means of his drenches and powders. But *mirabile dictû*, the pharmacopœia is not sufficient for the needs of some, they must fain resort to preparations concocted by wholesale chemists, the formulæ of which are trade secrets.

Judging by the testimonials given as to the efficacy of these trade preparations, and by the extent to which they are advertised, one must believe that they are largely used. Never before was the output of literature by chemists so extensive as at present. One has now but to name the disease and the remedy is suggested. The idea seems to be that the practitioner should adopt a sort of "penny in the slot" system in the treatment of diseases.

It is fortunate that a spirit of scepticism still exists amongst a certain number of practitioners, otherwise we should degenerate into a species of automata, believing all we hear and read, ignoring the *vis medicatrix naturæ*, and living in a fool's paradise, we should blindly accept as gospel the dogmas of credulous enthusiasts, whose faith in the virtues of drugs is only exceeded by their egotistical imagination of their own superior skill and knowledge.

No wonder that the pendulum is now commencing to swing in the other direction, and the time-honoured Epsom salt, with the assistance of Dr. Green, Dr. Nature, and Dr. Time are regarded as the most important attributes in therapeutics.

ABSTRACTS FROM FOREIGN JOURNALS.

The Microbe of Avian Diphtheria.

Avian diphtheria presents certain analogies with human diphtheria, by its aspect and its localisations in the buccal cavity and upon the eye. It is distinguished essentially, however, by its chronic and often torpid character, and by its course, which is very often capricious and irregular.

J. Bordet and V. Fally *(Annales de l'Institut Pasteur)* now describe a microbe in connection with avian diphtheria which differs essentially from those dealt with in the numerous works which have already appeared upon this subject. It does not develope upon the ordinary culture media sterilised in the autoclave; and even upon more suitable media (those rich in defibrinated blood) the growth is so thin that it almost escapes the sight.

To obtain a pure culture, recourse should be had to the exudate from the membrana nictitans, which may be obtained in either the naturally or artificially produced disease. This is sown upon nutritive media containing the defibrinated blood of the rabbit, in preference to that of the fowl.

Under the microscope, the microbes are found to be very small. Often they appear as points, sometimes slightly elongated into thin short rods. The best staining results are obtained by Giemsa's stain. The microbe is non-motile; its growth is fairly rapid; and its vitality fairly great. It grows with facility in bouillon-serum, and upon gelose-blood.

After numerous re-cultures, the cultures still cause the characteristic malady when founded and inoculated upon the buccal mucous membrane by scarification, or preferably upon the membrana nictitans by means of a thread soaked in the emulsion.

The authors have thus transmitted the disease to fowls, causing the characteristic lesions and an extraordinary abundance of germs in the exudate. The microbes have the same morphology as in the cultures, except that they are much more rarely found in clusters. This exudate, when sown upon suitable media, furnishes an almost pure culture of the virus.—*La Semaine Veterinaire.*

A Modification of the Technique of Chloroform Administration.

Charmoy *(Recueil d'Alfort)* describes a method of chloroforming small animals which is analogous to that employed in human surgery by Dr. Klapp. It consists of withdrawing a portion of the blood from the action of the chloroform by means of elastic ligatures placed at the roots of the anterior and posterior limbs, and tightened so as to occlude the circulation. Loss of consciousness is then more easy, and takes place earlier; while recovery is more rapid, for the blood which has been imprisoned by the ligatures and shut out from the action of the chloroform, dilutes and purifies that which has undergone the influence of the drug as soon as it is allowed to re-enter the circulation. It

is also charged with carbonic acid, which excites the bulbar respiratory centre; and finally, in the case of syncope, it is said to form "a veritable transfusion of blood." This method is very advantagious and presents few inconveniences. The double radial paralysis resulting from the constrictions of the fore limbs disappears very rapidly, and may have a favourable action in certain cases by preventing the patient from moving for some time. —*La Semaine Veterinaire.*

W. R. C.

[I believe that some surgeons who have practised Klapp's method upon human patients pronounce it by no means free from danger.—TRANSL.]

IMMUNISATION OF CATTLE AGAINST TUBERCULOSIS.

By E. C. SCHROEDER and JOHN R. MOHLER, of the Bureau of Animal Industry.

[AN ABSTRACT.]

Probably no methods for the immunisation of cattle against tuberculosis have been more widely discussed, or have given better results than those known as Pearson's and von Behring's. The two are practically alike, and consist of the intravenous injection of living cultures of human tubercle bacilli, of a virulence too low to cause a progressive tuberculosis in cattle. The tubercle bacilli are grown in artificial cultures, and, in a very finely subdivided condition, suspended in fluid, in definitely known quantities, are injected into a vein of the animal to be protected. The methods of bovo-vaccination of Pearson and von Behring were both tested, with what results will follow later.

In addition to studying the foregoing methods, attempts were made to cause immunity by subcutaneous injections of tubercle bacilli of different degrees of virulence as well as by transfusion of blood from artificially immunised to susceptible animals.

Finally a test was made of what is known as Heymans' capsule method of protective treatment, for the efficiency of which the discoverer, after applying it to a large number of animals in his own country, makes very strong claims.

TEST OF BOVO-VACCINATION ACCORDING TO THE METHOD OF VON BEHRING.

On June 2, 1906, the first nine calves, and on June 12, the tenth calf in the following list were given each an intrajugular injection of 3c.c. of a suspension of tubercle bacilli of the human type. The tubercle culture used to make the suspension was "Case 30," and each c.c. of the suspension was equal to 0·0013 grams of tubercle bacilli.

Bull	Calf	No. 427,	about	2	to 2½	months old.
Bull	Calf	No. 429,	"	2	2½	"
Bull	Calf	No. 431,	"	2	2½	"
Heifer	Calf	No. 432,	"	2½	3	"
Heifer	Calf	No. 435,	"	2	2½	"
Heifer	Calf	No. 436,	"	2	2½	"
Bull	Calf	No. 438,	"	2	2½	"
Bull	Calf	No. 439,	"	2½	3	"
Bull	Calf	No. 441,	"	2	2½	"
Bull	Calf	No. 444,	"	3	3½	"

The ages of the calves as above given refer to the date on which the injections were made.

With the exception of a subsequent, short-lived elevation of temperature, and the development of a small tumour in the skin over the jugular at the point of injection in several of the calves, the injections were followed by no marked adverse conditions.

On September 7, 1906, each of the ten calves was given a second intrajugular injection of tubercle bacilli prepared from culture "Case 30." The suspension used for the second injection, of which the dose was 3 c.c., represented 0·02 gram of tubercle bacilli per c.c.

The second injection was followed by a more marked elevation of temperature than the first, which may, in part at least, be attributed to the mechanical irritant action of the injected tubercle bacilli in the fine pulmonary capillaries.

Of the ten calves one, No. 444, was killed and examined post-mortem without being exposed to tuberculosis, to determine what changes had been caused by the injections of tubercle bacilli it had received. The remaining nine were exposed to a tuberculous environment as follows:—

Nos, 427 and 432—October 30, 1906.
Nos. 429 and 435—February 27, 1907.
Nos. 431 and 436—April 25, 1907.
Nos. 438 and 441—July 25, 1907.
No. 439—November 8, 1907.

Control animals were added at the time of each exposure, but as a matter of convenience the controls will be treated separately, as such treatment will facilitate a better comparison between the several protective methods against tuberculosis tested.

The tuberculous environment to which the animals used in these experiments were exposed was a large cow stable with an adjacent cow yard. In this stable and yard the infection was provided by a number of cattle affected with advanced tuberculosis, of which it was definitely known that they were freely expelling tubercle bacilli. In the yard, into which the cattle were turned daily for from two to eight hours, depending upon the state of the weather, all the cattle, treated, checks and diseased, were allowed to mingle as they chose; in the stable the cattle were made to occupy stalls in such rotation that the exposure of the different individuals was equalised as much as possible.

The dates on which the ten calves were killed and a short memorandum of the lesions found on autopsy follows:

No. 444, treated, but not exposed, reacted to tuberculin on October 17, 1907 (13 months after last bovo-vaccination injection. Killed November 7, 1907. No lesions found, but firm pulmonary adhesions and one small glistening nodule, 3 mm. diameter, in the lung. No tubercle bacilli on microscopic examination or animal inoculation were found in the minute glistening nodule, which may have been a small, healed tubercle, caused by bacilli from one of the intravenous injections.

No. 427, killed April 23, 1908, after having been exposed to a tuberculous environment for about 18 months, No lesions of tuberculosis.

No. 432, killed March 9, 1909, after having been exposed to tuberculous environment over two years. No lesions of tuberculosis.

No. 429, killed July 16, 1909, after having been exposed to a tuberculous environment over two years. No lesions of tuberculosis.

No. 435, killed April 10, 1909, after having been exposed to a tuberculous environment over two years. One post pharyngeal gland twice the normal size and almost entirely tuberculous. No other lesion.

No. 431, killed March 25, 1909, after having been in a tuberculous environment almost two years. Mediastinal glands contain a number of minute necrotic foci, which failed to show the presence of tubercle bacilli on microscopic examination and guinea-pig inoculation. Lungs contain a number of minute areas which have the appearance of healing tubercles; no bacilli found in these areas.

No. 436, killed March 29, 1909, after having been in a tuberculous environment almost two years. No lesions of tuberculosis.

No. 438, killed April 10, 1909, after having been in a tuberculous environment over two years. No lesions of tuberculosis.

No. 441, killed April 9, 1909, after having been in a tuberculous environment over two years. Autopsy showed minute lesions in the azyagos lobe of lung, and a small focus, 3 mm. diameter in the right prescapular gland. No tubercle bacilli found in the lung lesions. The prescapular lesion showed tubercle bacilli on microscopic examination and guinea-pig inoculation.

No. 439, killed March 29, 1909, after having been exposed about sixteen months to a tuberculous environment. Tubercles in the posterior mediastinal glands, which on guinea-pig inoculation caused generalised tuberculosis.

Test of Pearson's Method.

On June 2, 1906, the first nine calves, and on June 12 the tenth calf in the following list, were given each an intra-jugular injection of 3 c.c. of a suspension of tubercle bacilli of the human type. The tubercle culture used to make the suspension was "Case 32," and each c.c. of the suspension was equal to 0·0013 gram of tubercle bacilli.

Heifer	Calf	No. 412,	about 4	months	old.
Heifer	Calf	No. 413,	„ 3	„	
Bull	Calf	No. 425,	„ 2½ to 3	months	old.
Bull	Calf	No. 426,	„ 2½	3	„
Bull	Calf	No. 428,	„ 2½	3	„
Heifer	Calf	No. 430,	„ 2½	3	„
Bull	Calf	No. 433,	„ 2½	3	„
Bull	Calf	No. 440,	„ 2½	3	„
Heifer	Calf	No. 442,	„ 2½	3	„
Heifer	Calf	No. 445,	„ 3		„

The ages of the calves as given above refer to the date on which the injections were made.

On July 18, 1906, the ten calves were given a second intrajugular injection of a suspension of tubercle bacilli in all respects relative to dose and strength similar to the first injection.

On September 11, 1906, the calves received a third intrajugular injection of a suspension of tubercle bacilli. The third dose like the other two was 3 c.c., but the suspension was stronger, 1 c.c. being equal to 0·02 gram of tubercle bacilli.

Of the ten calves one, No. 445, was killed and examined post-mortem without being exposed to tuberculosis, to determine what lesions, if any, had been caused by the three injections of tubercle bacilli. The remaining nine calves were exposed to a tuberculous environment as follows:

Nos. 412 and 425—October 30th, 1906.
Nos. 413 and 426—February 21, 1907.
Nos. 428 and 430—April 25, 1907.
Nos. 433 and 442—July 25, 1907.
No. 440—November 8, 1907.

Control animals were added at the time of each exposure. The character of the tuberculous environment has already been described.

The dates on which the ten calves were killed and a short memorandum of the lesions found on autopsy follow:

No. 445, treated, but not exposed, reacted to tuberculin on October 17, 1907 (about thirteen months after last bovo-vaccination injection). Killed Nov. 7, 1907. No lesions of disease.

No. 412, killed April 23, 1908, after having been exposed to a tuberculous environment about eighteen months. No lesions of disease.

No. 425, died December 18, 1906, after having been exposed to a tuberculous environment about six weeks. Cause of death, inflammation of the intestines. No lesions of tuberculosis.

No. 413, killed August 9, 1909, after having been exposed to a tuberculous environment over two years. No lesions of disease.

No. 426, killed April 1, 1909, after having been in a tuberculous environment over two years. Lungs were found to contain a few very minute tubercles.

No. 428, killed March 29, 1909, after having been in a tuberculous environment nearly two years. No lesions of tuberculosis.

No. 430, killed March 22, 1909, after having been in a tuberculous environment nearly two years. The pleura and mediastinal glands showed minute lesions closely resembling tuberculosis, but no tubercle bacilli could be found in these lesions by microscopic examination or guinea-pig inoculation.

No. 433, killed July 16, 1909, after having been exposed to a tuberculous environment about two years. No lesions of tuberculosis.

No. 442, killed July 16, 1909, after having been exposed in a tuberculous environment about eighteen months. No lesions of tuberculosis.

No. 440, killed April 10, 1909, after having been exposed to a tuberculous environment nearly eighteen months. No lesions of tuberculosis.

Vaccination by Subcutaneous Injections.

Injections into the end of the Tail.

As the earlier investigations of the Bureau of Animal Industry on the subject of protective inoculations against tuberculosis had given results indicating that the degree of immunity conferred by the injection of living tubercle bacilli into the bodies of cattle depended rather upon the virulence of the injected bacilli than upon the method of injection or the number of injections, a series of tests were made relative to the effects from injecting cattle with quite virulent tubercle bacilli into a portion of the body, the end of the tail, from which the infection, with its strong tendency to become localised, would have to move some distance before it could reach its favourite locations in the body. The end of the tail also offered the advantage that the character and progress of the inoculation disease could be watched, and that treatment, surgical if necessary, could be applied.

On June 20, 1906, the following four calves received each a subcutaneous injection, immediately above the brush at the end of the tail, of 3 c.c. of a suspension of bovine tubercle bacilli. The tubercle culture used was "Bovine III." and each 3 c.c. of the suspension was equal to 0·01 gram of tubercle bacilli.

Heifer	Calf	No. 447,	about 3	months	old.
Heifer	Calf	No. 448,	„ 3	„	
Bull	Calf	No. 450,	„ 3	„	
Bull	Calf	No. 451,	„ 2½	„	

The tuberculous disease caused in the tails of the animals varied considerably. In one case, No. 447, it was necessary to amputate the tail. The four animals were exposed to a tuberculous environment beginning sometime after the protective injections had been made; later on, when they were killed and examined post-mortem, all, with the exception of No. 450, were found to have tuberculous lesions directly traceable to the tubercle bacilli injected into the ends of their tails, proving definitely that the strain of tubercle bacillus used was too virulent for the injection of calves in any manner.

Calf No. 450, after remaining in a tuberculous environment for several years, was found on autopsy to be in excellent condition and entirely free from lesions of tuberculosis.

On June 20, 1906, the following five calves received each a subcutaneous injection, immediately above the brush at the end of the tail, of 3 c.c. of a suspension of

virulent, human tubercle bacilli. The tubercle culture used was "Boy V.," and each c.c. of the suspension represented 0·01 gram of tubercle bacilli.

Heifer	Calf	No. 449,	about 3½	months old.
Bull	Calf	No. 452,	„ 2½	„
Bull	Calf	No. 453,	„ 2½	„
Bull	Calf	No. 454,	„ 3	„
Heifer	Calf	No. 455,	„ 3	„

With the exception of slight swelling at the seat of injection, which gradually subsided, the treatment received by the calves caused no visible lesions.

Some time after the protective injections were made the calves were exposed to a tuberculous environment, and later on killed and examined post-mortem.

Calves Nos. 449 and 453 showed no lesions of tuberculosis either as a result of the protective injections or the exposure.

Calves Nos. 452 and 454 showed a small tuberculous abscess at the seat of inoculation in the tail and small tuberculous foci in the coccygeal lymph glands (the lymph glands located near the root of the tail), and no lesions as a result of the exposure to tuberculosis after the protective injections had been made.

Calf No. 455 was found on autopsy to have tuberculous lesions in the coccygeal and pharyngeal lymph glands, or, in other words, to have contracted tuberculosis both from the protective injection and subsequent exposure.

All the tuberculous lesions found were small, but cattle Nos. 452, 454 and 455 show conclusively that the strain of tubercle bacillus injected was too virulent to be used for immunising purposes. Cattle Nos. 449, 452, 453, and 454 indicate that even a subcutaneous injection of tubercle bacilli can protect against subsequent exposure to a tuberculous environment, *and No. 455 shows that a tuberculous process induced by inoculation does not necessarily, in all instances, protect against fresh infection from without, and this is one of the most important facts with which we have to deal in the question of bovo-vaccination.*

On November 14, 1906, the following cattle received each a subcutaneous injection, immediately above the brush at the end of the tail, of 3 c.c. of a suspension of bovine tubercle bacilli. The tubercle culture used was "Bovine III." and each c.c. of suspension was equal to 0·01 gram of tubercle bacilli.

Heifer	No. 406,	about	18	months old.
Heifer	No. 386,	„	16	„ „
Cow	No. 336,	„	3	years old.
Cow	No. 215,	„	6	„ „

One of the above animals died about four months after injection, cow, No. 336, without additional exposure to tuberculosis. The cause of death was inflammation of the intestines, but she showed a well-marked tuberculous lesion in her tail at the seat of injection and tuberculous lesions in four mediastinal glands. All other parts of her body were free from tuberculosis.

Heifers No. 406 and 386, and cow No. 215 were killed after having been exposed to a tuberculous environment for quite a long time, and showed tuberculous lesions which may have been caused in part by exposure and which were certainly caused in part by the injection of tubercle bacilli.

Injections Under the Skin of Neck.

On June 21, 1906, the following five calves were each injected with 3 c.c. of a suspension of virulent human tubercle bacilli. The dose in each case was divided into two parts, and one part introduced under the skin on the right side of the neck, and the other part under the skin on the left side of the neck. Each 3 c.c. of the suspension injected represented 0·01 gram of tubercle bacilli.

Bull	Calf	No. 456,	about 2½	months old.
Bull	Calf	No. 457,	„ 3	„ „
Bull	Calf	No. 458,	„ 2½	„ „
Heifer	Calf	No. 459,	„ 2½	„ „
Heifer	Calf	No. 462,	„ 2½	„ „

Calves Nos. 458 and 462 died in about two months as a result of tuberculosis caused by the injections of tubercle bacilli. The remaining three animals were exposed to a tuberculous environment for some time and subsequently killed and examined post-mortem. All showed extensive lesions of tuberculosis, no doubt almost entirely due to the injections of tubercle bacilli, showing that either this method of treatment was too severe or that the culture of tubercle bacilli used was too virulent.

In addition to the foregoing subcutaneous injections, six calves were given each two successive injections of virulent tubercle bacilli, with an interval between the two injections. These calves all contracted tuberculosis from the treatment received, and simply emphasise that subcutaneous injections, no matter what part of the body is used as the seat of injection, are dangerous when the bacilli injected have a true virulence for cattle. In a later, fuller report on this work it is hoped that the lesions caused by the various injections may be given and discussed in detail.

Among the subcutaneous injections, only those made into the ends of the tails of calves 449, 452, 453, 454 and 455, with virulent human cultures, hold out any encouragement that a subcutaneous method of protective inoculations against tuberculosis can be developed. The results with these animals, however, are quite encouraging, and merit that successive injections, into the tails of cattle, beginning with quite avirulent cultures, should be tested.

Checks or Control Animals.

The following eleven untreated cattle, which were similar in age, size and condition to those given intravenous protective treatment according to the methods of Pearson and von Behring, were exposed for the same length of time to the same tuberculous environment to which the treated or protected animals were exposed. For the sake of brevity only a sufficient account of these animals will be given now to show that the environment contained the necessary amount of virulent, infectious material to cause tuberculosis of most cattle exposed in it.

Heifer No. 471 contracted tuberculosis of the mediastinal and mesenteric glands.

Heifer No. 472 contracted tuberculosis of one post-pharyngeal gland.

Heifer No. 475 contracted tuberculosis of the mediastinal glands.

Heifer No. 526 contracted tuberculosis of the mediastinal glands.

Steer No. 530 contracted tuberculosis of the lung and mediastinal glands.

Steer No. 531 remained healthy.

Heifer No. 539 contracted tuberculosis of one post pharyngeal gland.

Heifer No. 540 contracted generalised tuberculosis.

Heifer No. 570 contracted tuberculosis of the mediastinal glands.

Bull No. 573 contracted tuberculosis of the lung and mediastinal glands.

Cow No. 579, remained healthy.

Of course it is to be understood that these cattle were carefully tested with tuberculin and found to be free from tuberculosis before they were exposed as control animals in the experiment. It is desired to avoid all detail not to some extent essential for a general statement in the present report. In the ultimate, full report which the Bureau of Animal Industry will publish, the complete history of each and every animal will be given.

In addition to the check or control cattle specially related to the tests of the Pearson and von Behring methods of bovo-vaccination, three other check animals were also introduced into the same tuberculous environment which was in all instances used as the means to test the amount of immunity acquired by the treated animals in these series of experiments.

The three additional animals are Nos. 477, 484, and 549, and all three contracted tuberculosis as the result of the exposure, giving a total of fourteen checks or controls of which twelve became infected with tuberculosis, thus showing that the character of the exposure to which the treated cattle were subjected was quite severe. The time at which the various control animals were introduced into the tuberculous environment, and the length of time they were permitted to remain in it, was carefully planned in connection with the exposure of the treated animals so that any failure among the latter to become infected could be properly valued through a comparison of the treated with the control animal.

One statement which has an important bearing on the intravenous methods of producing resistance against tuberculosis must be added here. All our cattle treated with intravenous injections of tubercle bacilli showed, on careful post-mortem examination, some pulmonary lesions, like thickening of the pulmonary connective tissue, adhesions between the lobes of the lungs and of the lungs to the chest wall and diaphragm, to be sure only very slight in most instances, but which could be accounted for in no other way than as remnants of the disturbance caused by the injected bacilli. This alone constitutes a condition which should receive further attention before a system of bovo-vaccination requiring the intravenous injection of living cultures of tubercle bacilli is practiced on a wholesale scale, and in conjunction with what we know about the retention of tubercle bacilli in the tissues after injection and the uncertainty about the manner and state in which they leave the body, should teach us to proceed cautiously in the adoption of protective methods, notwithstanding the fact that the results obtained prove conclusively that actual, strong resistance to tuberculosis can be established by using them.

Comparison of the Foregoing Methods.

From the brief records that have been given we see that three of the nine cattle treated according to the method of von Behring and afterwards exposed contracted tuberculosis, that one of the nine cattle treated by the method of Pearson and afterwards exposed contracted tuberculosis, and that of fourteen checks or untreated control animals twelve became infected on exposure.

Of the eight animals that received injections of bovine tubercle culture subcutaneously into the ends of their tails, four old and four young animals, all but one young animal contracted disease as the result of the injections. The one that escaped disease from the injection also resisted tuberculosis on exposure.

Of the five cattle that received human culture injections into the ends of their tails, two became immune without inoculation disease, two were immune but had slight inoculation disease, and one had both inoculation and exposure disease.

The injection of tubercle cultures under the skin of the neck of animals caused them all to contract tuberculosis.

The several methods may be compared as follows:

von Behring Cattle	66 2/3 %	Successfully protected for a period approximating two years.
Pearson Cattle	88 8/10%	
Bovine Culture, Tail	12½%	
Human Cultures, Tail	40%	
Injections Under Skin	0%	

The human cultures, tail, it should be borne in mind actually protected eighty per cent. of the cattle treated against the infection in the environment to which they were exposed.

The above percentages can best be valued by comparing them with the check or control animals, among fourteen of which, only two, or fourteen and two-sevenths per cent. escaped.

If the only question to be considered in connection with bovo-vaccination was the protection of cattle against tuberculosis the foregoing results would give us excellent reasons to be very cheerful. Lately, however, studies made by various investigators on the elimination of tubercle bacilli after injection from the bodies of animals, teach us to be very careful about adopting methods of immunisation for purely economic purposes that may be dangerous for those who afterwards use the products of the treated animals.

The work of the Bureau in the past has also demonstrated that tubercle bacilli injected into the circulation or under the skin of cattle may remain incorporated in their tissues for long periods of time with only a gradual or very slow loss of virulence. These are important factors that must not discourage further work to build on the knowledge we have gained, but which must be kept in mind and be permitted to have their due influence on our subsequent investigations.

Very careful autopsies of cattle treated by intravenous inoculations of tubercle bacilli according to the methods of von Behring and Pearson, show that the more or less attenuated tubercle bacilli that engender immunity against tuberculosis rarely leave the treated subjects wholly free from lesions that can be accounted for in any other way than as due to the pathogenic activity within the animal's body of the injected bacilli.

General Conclusion.

The only conclusion to which we are entitled from this work and the careful studies of the writings of others that we have made of the subject of protective inoculation against tuberculosis may be stated as follows: Though results have been obtained which are very encouraging to the investigator and which prompt him to strive onward with renewed vigour and hope, *no system of bovo-vaccination has reached a stage at the present time that justifies its use in common practice.*—American Veterinary Review.

LIVERPOOL UNIVERSITY VETERINARY MEDICAL SOCIETY.

The general meeting was held in the Veterinary Department of the University, on Friday, October 21st. Present: W. Woods, Esq., President, Messrs. J. B. Wolstenholme, Stafford Jackson, J. T. Share-Jones, Maguire, H. Sumner, E. Wood, E. J. Burndred, F. A. Ball, R. F. Watson, J. P Heyes, W. A. Taylor, J. Adamson, Prof. Annett, W. J. Fletcher, G. H. Locke, T. Dobie, P. Carter, and H. Richardson.

Apologies for non-attendance were received from Sir Rubert Boyce, Messrs, R. Hughes, J. Storrar, and T. Eaton-Jones.

The meeting was opened by Mr. J. T. Share-Jones, F.R.C.V.S., who gave a very interesting demonstration of the Anatomy of the larynx as applied to the various operations for roaring, and each operation was described in detail. A number of specimens were provided.

A vote of thanks was proposed by Mr. Atkinson for the interesting demonstration afforded by Mr. Share-Jones, which was seconded by Mr. Stafford Jackson, and carried.

Luxation of Flexor Metatarsi.

The meeting then adjourned to the yard to examine a very interesting case of luxation of the flexor metatarsi muscles, submitted by Mr. Stafford Jackson.

Mr. Woods: I have to thank Mr. Stafford Jackson for bringing to our notice this most interesting case. I may say that I have come across a few cases of this kind, and all cases seen by me made a good recovery practically without treatment at all. It has been remarked that it is seen frequently in pit ponies, but I do not recollect ever having seen a single case in the pit. The few cases that I have seen they were all in young animals; the worst I saw was in a three-year-old: I have never seen it in any animal five or six years of age. I think we ought to move a vote of thanks to Mr. Stafford Jackson for taking the trouble to bring to our notice this most interesting case.

Mr. Atkinson: I wish to second Mr. Woods in proposing a vote of thanks to Mr. Stafford Jackson for the most interesting specimen he has provided. I saw a similar case myself two years ago last winter. It was a three-year-old pony, and ultimately made a good recovery without treatment at all.

Mr. Heyes also seconded the vote of thanks which was supported by Mr. Wolstenholme.

Mr. Stafford Jackson: I am very pleased to have been able to supply a specimen that should interest you all, but I may say in the first place that the thanks are due to my friend, Mr. Henry Sumner. Some of you know we are great antagonists. Some may know we are great friends (applause). When the students who were attending my infirmary had seen it, I telephoned to Mr. Sumner, who said "send it on here." Now with regard to these cases, I have seen three cases, this is the third.

The first was a tradesman's pony, which was being recklessly driven by the man in charge, and on turning a corner both hind legs went from under it. I was sent for, and when I got there I gave the man a sovereign for it. It was then my horse. I did this because I wanted to know what this particular case was. I kept it for two years. Eventually I destroyed it and made post-mortem examination. The flexor metatarsi muscles were semi-calcareous and could only be severed with difficulty. They had entirely lost their contractive power. On many occasions when it went down we had to lift it up and extend its limbs. I may say that it was an old mare.

The next case was a horse like Mr. Atkinson's, a young horse. I went and saw it and found it was exactly as this horse. There was no distension. It made an absolute and perfect recovery, and I believe is now working.

This brings me to the remarks about pit horses. I had a case, but when I showed it to the veterinary surgeon, who I may say has a practice in one of the largest pit districts in the United Kingdom, he said "We often get those in the pits."

The third case came in the last week in May. The history of the case was—the horse slipped with a load in a foundation, the tendons or muscles gave way and the legs went under him. We had great difficulty in getting him out of the place. He never showed any great pain. He was discharged the second week in July, and according to owners has been working ever since. I think that he will make a perfect cure.

A letter was read from Mr. Gofton inviting the Society to grant a contribution towards the expenses incurred by the Committee of the proposed Scheme for the Amalgamation of Veterinary Societies. It was agreed that a sum of one guinea be voted for that purpose.

A lengthened conversation took place in relation to the forthcoming Council election of the Royal College of Veterinary Surgeons. It was generally felt that the Society ought to use its influence to increase the representation of the Northern Counties. With this object in view certain names were submitted as highly eligible and popular candidates. The expediency of selecting one of these as the Society's nominee was considered, and referred to the Committee.

Regarding the election, it was agreed this Society co-operates with the Lancashire, Yorkshire, and Eastern Counties Societies as before.

Notice of motion had been given of a proposed alteration of the rules, with special reference to the income of the Society and the amount allocated to the Department of Comparative Pathology. It was pointed out that according to the present rules of the Society two-thirds of the gross income were granted to the Department of Comparative Pathology. This only leaves one-third for the use of the Society, and this has proved insufficient for the ordinary working expenses. There was, it was thought, reason to believe that the Department would be satisfied to receive less. Owing to the absence of Prof. Annett no attempt was made to determine the amount to be granted in the future. After further consideration the matter was referred to the Committee; its report to be submitted to the next meeting.

Reference was made to the amount of the subscription, and it was pointed out that other Societies did not make such a demand upon their members, but it was agreed that the facilities offered for pathological investigation of cases amply justified the amount.

Mr. Sumner: If our members would make up their minds and take advantage of the laboratory I think the rate is remarkably cheap.

Mr. Taylor: I must take this opportunity of stating that on all occasions when I have found it necessary to appeal to those in charge of the Pathology Laboratory for expression of opinion, I have always had a reply, and I have always been treated with courtesy in that Department.

Presidential Address: Resumed Discussion.

Mr. Sumner: Mr. President and Gentlemen,—I regret that I was unable to be present to hear our President's address, but have enjoyed the pleasure of reading it and in accepting the honour of opening the discussion. It is an unusual address both in being open for discussion and in containing such a wide field for consideration. I think all will agree that it is desirable that the office of President of this Association should be held by gentlemen who are not connected with the staff of the University, as by such means the interest is extended. As the practice of our profession is every changing, so also is the type of students entering our schools, and with all respect to those who have passed the portals of the Royal College—I believe I can justly claim that if the numbers are diminishing, the quality of the student is steadily rising, and at the present time many gentlemen of high educational attainments are amongst our number. The charm of our calling has not yet vanished, notwithstanding the coming of motors and the feeling that our licensing body is verging upon bankruptcy. I agree that the time has come when it is vital to our best interests to widen the sphere of our usefulness to the public in the way you suggest, and I would go further, and embrace the necessity of a closer study in all that pertains to the welfare of stock for dairying and the ailments of the smaller animals in our group. We can no longer afford to act as physician and surgeon, but must bring within our field of operations Hygiene and Preventive Medicine.

We must acknowledge the competition of the motor, even for the purpose of heavy haulage, and our President offers us two ways in which we can and ought to be of service to our clients—by the lengthening of the period of service, and by decreasing the cost of main-

tainence. Both appeal to us and are worthy of our earnest consideration. In these respects we must not only be capable as professional men, but must study the commercial side—as to the value and suitability of horses for particular purposes, and the price and quality of forage. An effort is made in the clinics of this school to study with great care the conformation most desirable for specific purposes, and the recognition of those defects which, although constituting unsounding, seldom interfere with usefulness. Value is another point which we lose no opportunity of considering. Forage is essentially one of our President's strong points, and I would only add one thought to his repetition of the expression of the candidates' fears as to grasses and rations, and that is, that the chemist's analysis does not represent that every ratio is acceptable to the living body. I would cite Indian corn, which has a low nitrogen ratio but which in practice is associated with many diseased conditions which might occur from a dietary in which the nitrogen ratio was excessive.

This brings us to the consideration of co-efficients, and it is one which cannot be over estimated. I am persuaded that the co-efficiency of any dietary depends upon good fellowship, by that I mean that to get the fullest result we must resort to a more or less mixed dietary, and it is possibly on this account that the compound cake or meal feeding for cattle is surely supplementing the old and purer cake and meal.

I had a very useful experience in some beasts at the Earl of Sefton's Home Farm, in relation to the value of turnips in conjunction with an ordinary ration for wintering stock. Part of those tied up had an allowance of pulped turnip, in addition to the same quantity of cake and hay fed to their fellows, the difference in the amount of weight and bloom was very considerable, suggesting that the influence of the roots, practically a negligible quantity on the chemical analysis, had a large effect in increasing the co-efficient of the ration.

Meat inspection, and other duties pertaining to public health, is another branch of our work of increasing importance, and I feel sure that when the time comes for the R.C.V.S. to review or extend the present curriculum these matters will receive the attention which the altered circumstances of our profession demand. I agree that it would be well for County Councils and other administrative bodies to have a veterinary surgeon, but I do not think it would be wise for such bodies to have greater power in adapting the orders of the Board of Agriculture and Local Government Board to their own particular district needs; I believe it is essential for the work to be co-ordinated and centralised.

The President practically confined his remarks on the study of hygiene to Preventive Medicine. May I go a little further in asking that the same study shall be applied to Preventive Surgery. I have already trespassed on your time, but I would like to say how great a part of your daily life it is to advise on the fitting of harness, to avoid the loss of service for such, in most cases preventible cases of sore shoulder, backs, and even facial paralysis arising from undue pressure, from the fashionable habit of stretching the face pieces of a bridle to maintain the desired curled shape of the draught horses blinkers. Even defective stable flooring whereby the horses can habitually get their toes into narrow drains or between boaler stones had appeared, in more than one instance, responsible for a number of horses suffering from contracted tendons.

Shoeing is almost of supreme importance in extending the working days of a horse, not only by a due regard for the most rational treatment of the foot, but also by a careful consideration of the adaption of a particular shape and tread to relieve both the troubles of the foot and the hundred and one diseases of the limb.

Mr. HEYES: I would like to express my appreciation of your efforts Mr. President, and also the consideration which Mr. Sumner has given to the question. You point out the other forms of traction which are brought before us, and you state that if the horse is to remain for many years a good competitor with other forms of traction, it is to be brought about by lengthening the working life of the horse and diminishing the cost of the keep, so that on common-sense grounds the horse will be retained. Mr. Sumner mentions several things including harness and shoeing. Both deserve more attention from us. I think more attention might be given to the subject of shoeing by the teachers in veterinary schools. Three-fifths of lameness in horses is brought about by defective shoeing, and much could be presented by a little consideration to this branch of surgery. Reference was made to Municipal appointments for our men: the equipment of veterinary surgeons, with the training given in the schools, is such a one that would make useful public men, and since it has become recognised that the lower animals may be, and frequently are connected with outbreaks of disease, municipal authorities have seen that it is necessary to have some one beside them. I feel that really there are very few Medical Officers of Health sufficiently conversant with matters relating to the lower animals, and it often happens that the veterinary surgeon has to advise upon such matters which the M.O.H. knows little or nothing about. It is necessary for the veterinary officer to be a whole time man; it is in the interests of the profession that he should not be engaged in ordinary practice. I think also that it is in the interest of the Municipality. The veterinary officer having no private interests to serve, his whole influence can be exerted to further the health of the community; it is impossible for us to serve two masters, and to encourage such employment is calculated to increase the esteem of members of our profession in the public eye. It is a very difficult matter to make owners of cattle and cowsheds spend money on improvement, and it is only a whole-time man, acting independently, who could do it properly.

Mr. ATKINSON: I must congratulate our friend Mr. Sumner on this subject. Having had many years experience as a veterinary inspector I know something of the relations of the veterinary surgeon to the Medical Officer of Health. Fortunately under my agreement I have nothing to do officially with the Veterinary Officer of Health. But in cases of dispute, I can call the M.O.H. in to look at the carcase. I have never lost sight of the fact that the Veterinary Inspector has the health of the community to consider. But the responsible man for the health of the community is the M.O.H. The veterinary surgeon is an officer under the M.O.H.; you can't have two heads, and in my opinion that M.O.H. is the responsible man. When you feel suspicious about a case and you call in the M.O.H. and he agrees that it should be passed, you feel much more confident. As regards our friend who says that he finds the condition of things are often worse where private practitioners are inspectors than in cases where the unqualified man is alone responsible; you get vested interests, and in many cases these are not easily ignored. As regards the education, there is a good deal of talk about the meat inspection and veterinary inspection, and in my opinion there is great room for improvement in all schools in regard to the teaching of these subjects.

Mr. FLETCHER referred to the various positions veterinary surgeons might take up, and complimented both the President and Mr. Sumner upou their addresses. He called attention to the method of shoeing that exists in Liverpool, and the remarks passed upon it at the Royal Show. Why should it not be a recognised fact that a horse should have a raised heel and toe. Surely those responsible for this method of shoeing are the best judges as to its effectiveness.

Mr. WOODS, in replying, said he much appreciated the generous criticism of the members, especially that of Mr.

Sumner. He could not help feeling his effort had been over-rated.

Regarding the method of shoeing adopted in Liverpool, he could only suppose that local conditions in regard to street pavement and heavy loads had determined the practice. It was an undoubted fact that the Liverpool cart horses take heavier loads than in any other city he knew. So far as he was concerned he always shod flat whenever possible. He quite agreed that the subject of meat inspection had not received the attention it deserved, and the only solution to this and other unsatisfactory features regarding the general scientific of our graduates was an extension of the curriculum to five years. This he felt was inevitable if we were to occupy the positions which were desirable in the interests of public health.

Regarding the value of Indian corn as a food he did not propose saying more, but he endorsed the opinion expressed by Mr. Sumner that the constitutional condition of American horses when landed in this country was largely due to the too exclusive use of this as an article of diet. The co-efficiency is always raised by a mixed diet, and this would account for the benefit which resulted from the addition of pulp turnips in the diet of cattle, instanced by Mr. Sumner. Turnips in themselves have little nutritive value but by their presence enchance the value of other foods.

He heartily endorsed the views expressed by Mr. Atkinson. The Department of Public Health must always be under the medical officer, but in all cases referring to the Diseases of the lower animals the veterinary officer should be consulted.

A vote of thanks to the President terminated the proceedings.

MIDLAND COUNTIES VETERINARY MEDICAL ASSOCIATION.

The quarterly meeting was held at the Black Boy Hotel, Nottingham, on Thursday, November 10th, the President, Mr. J. A. Gold, Redditch, being in the chair. There were also present Messrs. B. DeVine, Birmingham; F. H. Gibbings, Nottingham: G. Smith, Tunstall; W. H. Brooke, Handsworth; H. S. Reynolds, Daventry; G. Wartnaby, Burton-on-Trent; H. Fairer, Derby; F. J. Taylor, Moseley; J. J. Burchnall, Barrow-on-Soar; E. W. Parkes, Wellingborough; and the Hon. Sec., Mr. H. J. Dawes, West Bromwich, members; and Messrs. P. M. Evershed, Nottingham, and F. B. Gresham, Newark, visitors.

Apologies for unavoidable absence were announced from the following members:—Professors Dewar and McCall, Dr. Manley, Messrs. R. C. Trigger, J. W. Coe, John Blakeway, J. R. Carless, C. E. Dayus, D. Forwell, J. Malcolm, F. L. Gooch, F. W. Barling, H. Thackeray, F. V. Stewart, J. Martin, Marriott, Blunsom, T. Chambers, W. Carless, J. Blakeway, Jun., Byner, R. Hughes, J. Brain, W. Grasby, W. S. Carless, J. Bainbridge, H. Yeomans and others.

New Members.

Mr. F. B. Gresham, of Newark, was nominated for membership by Mr. Reynolds.

Mr. P. M. Evershed, of Nottingham, was nominated by Mr. Parkes.

The names will be submitted for election at the next quarterly meeting.

Sanitary Congress: Delegate's Report.

The President, who was a delegate of the Association to the Sanitary Congress held at Brighton, gave a short report. He said it was a very enjoyable gathering, and as he managed to combine pleasure with business he had a really good time. Of course he should not refer to anything that happened outside the Veterinary Section. There was a very good paper by Mr. Hunting on "Scarlet Fever in Relation to Cow's Milk," and although some of the medical men held that the cow herself was the actual culprit, the general opinion was that she must be looked upon as being the indirect, rather than direct, cause of scarlet fever. There was a feeling that undoubtedly in the human subject cases of sore throat occasionally arose at the same time that there was eruption on the teats of cows. That was described as specific sore throat by one medical man, who looked upon it as being very important.

A paper was read by Prof. Woodruff on "The Inspection of Dairy Cows and Cowsheds." It was a well written paper on lines with which they were doubtless familiar, and he urged the adoption of several Acts of Parliament to give better effect to the principles he laid down. That particular paper did not call forth a great deal of discussion, but there was plenty to be said on a paper by Mr. W. J. Young, Veterinary Inspector of Sheffield, dealing with the administration of the Model Milk Clauses in that city. The lay mind seemed to be opposed to any sort of officialism, and there was still much to be done to satisfy the public that a veterinary surgeon had an essential part to play in the protection of health. Mr. Young did not seem very definite on the tuberculin test for cows, but apart from that it was a most admirable and instructive paper.

The delegates visited the abattoir at Brighton, but it was a very small place, and although not without interest, there was not much to be learned from it. In conclusion, the President thanked the members for permitting him to represent them at the Congress.

Mr. Gibbings moved a vote of thanks to the President for his services as delegate, and said it was the proper thing for an Association such as that to be officially represented at Sanitary and Health Congresses generally.

This was seconded by Mr. Burchnall, and heartily carried.

Mr. Burchnall announced the resignation of Mr. Edwards, one of the Inspectors of the Board of Agriculture, on the ground that he was removing from Birmingham to Manchester, and on the motion of the President it was accepted with regret.

An Honour to the Profession.

The Hon. Sec. reminded the meeting of the fact that one of the oldest and most esteemed members, Mr. R. C. Trigger, had the previous day been elected Mayor of Newcastle-under-Lyme. The honour was all the greater since Mr. Trigger was not a member of the Town Council, and had been chosen from outside that body. This great tribute to his worth from his fellow citizens was one which this Association appreciated as well as Mr. Trigger himself, for the honour was one in which the whole profession to some extent shared. (Applause.) He moved the immediate despatch of the following telegram:

"To the Mayor, Newcastle-under-Lyme.
Midland Counties Veterinary Medical Association in quarterly meeting at Nottingham thank you for the honour which your election as Chief Magistrate of Newcastle confers upon the profession."

This was seconded in cordial terms by Mr. Wartnaby and carried by acclamation. Later on a reply was received from Mr. Trigger thanking the Association for their kind message.

EPIZOOTIC ABORTION IN CATTLE.

By BRENNAN DEVINE, F.R.C.V.S., D.V.S.M.
City Vety. Dept., Birmingham.

When it was suggested to me that I should read a paper on Contagious Abortion of Cattle at this meeting, I hesitated considerably before agreeing. I was conscious that there must be many older members of this Association with extensive experience of the disease who would, if asked, be willing to lay their knowledge and practical experience before you. And it was only when I was assured that my paper would be regarded simply as an introduction of the subject for your discussion and not as an elaborate treatise that I ventured to acquiesce in the request of our President, a request, I need scarcely say, which I value very highly.

I know, of course, that you are all aware that contagious abortion has been much in evidence in recent times in this country. This is chiefly due to the publication of the Board of Agriculture Departmental Committee's reports. The wide prevalence of the disease caused the Board to appoint a committee in 1905 to inquire into the matter. Since then this Committee has been carrying out investigations as to the prevalence of the disease, its cause and spread and the methods that should be employed for its prevention, and has issued two reports, the first dealing pretty exhaustively with the etiology of the disease; the second making certain recommendations as to the measures necessary for prevention, with the minutes of evidence of witnesses taken in connection therewith.

I take it that what your President desires to-day is that we should discuss this subject in the light of these reports and such other up-to-date matter as may be available, and consider what measures are practicable for dealing with this scourge. Before proceeding to this, a word in passing may be permissible on past experience of the disease.

HISTORY.

The literature on the subject proves that this disease is of no recent origin. It has been known and described by some of the earliest writers on Veterinary Science. It is evident from the writings of Mascal 1589, Lafosse 1795, that abortion in cattle in their time assumed an epizootic character.

Skellett 1807 says "slipping, slinking or miscarriage is an accident to which cows are very liable." He attributed the cause to violent exercise, frights, knocks, and nauseous smells, and he also says it has been known to spread like an infectious disease. For treatment he recommended strict isolation, blood letting and purgatives.

In 1875 St. Cyr said he believed abortion was due to a specific agent. Previous to this every outbreak of abortion was attributed to Ergot, accidents, or unhygienic environments.

Franck, in 1880, produced abortion experimentally in cows by placing the vaginal discharge of an infected cow into the vagina of a healthy pregnant cow. Franck attributed the disease to the Lepothrik Vaginates, but this was not substantiated by subsequent observers.

Nocard, who investigated the disease in 1886, found a purulent exudate in the uterus of affected cows, and from this he isolated two organisms (1) a micrococcus and (2) a short, delicate bacillus.

In April, 1886, a committee composed of the following gentlemen: Messrs. Sims Woodhead, Aitken, M'Fadyean and Campbell were appointed by the Highland and Agricultural Society to investigate the disease. In their investigations they conveyed the disease experimentally to non-infected animals and isolated several different organisms.

Galtier (1890), infected healthy pregnant animals by feeding them on fœtal membranes passed by infected cows.

Bang and Stribolt investigated the disease in 1895-97. Bang isolated a bacillus which was capable of conveying the disease to non-infected animals, thus proving that it was contagious and due to a specific organism.

PREVALENCE IN GREAT BRITAIN.

The evidence of the eighteen witnesses called before the Epizootic Abortion Committee, and who were there to represent the views of the leading Agricultural and Cattle Breeding Societies of the country, prove incontestably that abortion in dairy and breeding herds now amounts to what may fairly be termed a veritable cattle plague.

The late John Speir, of Newtown, in testifying as to its prevalence, was asked as to the proportion of infected farms in Scotland. He replied, roughly speaking about one fourth, and he submitted a series of tabulated statistics respecting 470 herds reported upon during the years 1908—9 which showed that 1 in 3 of these were affected, and that one cow in 46 of those calved prematurely. The other witnesses unanimously concurred that the disease was extremely prevalent and the loss incurred thereby great, one witness even calling it enormous.

Geographical Distribution. Needless to say abortion is not confined to Great Britain. It is very widely distributed. In Germany, Norway, Denmark, Holland, France, it has been widespread for many years. In other continental countries and in America the disease is also prevalent.

DEFINITION AND ETIOLOGY.

Epizootic abortion of cattle is now recognised as essentially a specific, contagions, catarrhal inflammation of the pregnant womb, with an œdematous condition of the fœtal membranes, due to the presence of a particular bacterium, and resulting in the expulsion of the fœtus prior to the full time of gestation, usually from the third to seventh month.

Bang's experiments and those of the Departmental Committee place its contagious character scientifically beyond question. There can no longer be doubt about that. Moreover, the fact of its being a contagious disease is now generally accepted by the farming public. This was very clearly brought out by the evidence of several witnesses before the Departmental Committee. The Report says "That the majority of witnesses expressed the opinion that very few farmers are unaware that the disease is contagious, and there appeared to be general agreement that the danger in introducing a cow which has recently aborted into a healthy herd is very widely recognised."

The Committee's investigation into the etiology of the disease seems to have been so painstaking and thorough that a brief *résumé* of some of the points which they have verified or brought to light can scarcely fail to interest; but all those who have to deal with abortion in their practice should carefully study the actual reports.

The Causal Organism of epizootic abortion in cattle is known as Bang's bacillus. The bacillus varies in length from 1 to 3 microns usually about 1 μ; each bacillus usually contains 1 to 3 elongated granules. They are non-motile and do not stain by Gram. They stain well with methylene blue or dilute carbol fuchsin; with fuchsin the whole bacillus often takes on the colour. With methylene blue the granules take up the stain more readily than the other parts. The bacillus is present in large numbers in the uterine exudate, or in the œdematous fluid of the fœtal envelopes of an affected cow. The bacilli are also usually present in the stomach fluid and the heart blood of the fœtus.

Biological Characters. For artificial cultivation it is best to obtain the material from the uterine exudate or fœtal stomach.

In serum gelatine agar, colonies develop ½ cm. under the surface of the medium in 2 to 4 days. The individual colonies are about the size of a pin's head, and when examined under a magnifying glass their edges are seen to be finely dentated.

Agar. In order to obtain growths on agar you must incubate it for 10 days or more. Growths may be obtained in 2 to 3 days if the culture is sown in the top fluid expressed on the agar gelatine serum tubes.

Potato. Potato is a good medium for growing subcultures. The growth is apparent after 7 to 10 days incubation. It begins as a honey coloured layer, and later becomes chocolate colour, and is indistinguishable from glanders culture grown on the same medium.

Gelatine. Gelatine is not a suitable or convenient medium for cultivation of the bacillus.

Milk. The abortion bacillus grows well in sterilised milk, but the medium is not a convenient one.

Glycerine Broth & Serum & 1% Grape Sugar. The abortion bacillus is said to grow more luxuriantly in this medium than any other. The growth appears as a grey precipitate, later on yellow and grey flocculi appear.

Vitality. In a moist state a temperature of 55°C. kills the bacillus in two hours. If kept in water a temperature of 60°C. kills it in ten minutes. It grows best at a temperature of 30 to 37°C. If a culture is started for a few days in the incubator its growth increases later at room temperature.

If virulent material, such as the uterine exndate, is kept fluid and free from putrefaction it remains infective for seven months, but not for a year.

Inoculation Experiments.

The bacillus of cattle abortion when introduced experimentally is capable of producing abortion in pregnant cows, ewes, goats, bitches, and guinea pigs. Bang and the Epizootic Abortion Committee of the Board of Agriculture do not consider that the causal organism of contagious abortion in mares is the same organism as that which causes the disease in cattle. Although the bacillus of cattle abortion has experimentally caused abortion in sheep, it has never been found naturally in sheep affected with abortion ; in fact a vibrio has been isolated from the placenta of ewes that have aborted in the field. Galtier, as quoted by Law, succeeded in conveying the disease experimentally from cow to sow, ewe, goat, rabbit, and guinea pig, and found that the growth in the body of the rodent intensified its virulence so that it could then be successfully inoculated on the mare bitch and cat.

Vehicle of Contagion. The vehicle of contagion is the utero-vaginal discharge which takes place from an infected cow at the time of abortion and for some time subsequently. (I have a specimen here).

Paths of Infection : Methods of Spread.

As already stated the Scotch Committee and others conveyed the disease experimentally by introducing into the vagina of healthy pregnant cows virnlent material from cows that have aborted, hence we may look upon the vagina as one point of entrance for the virus.

Galtier, Nocard, and others conveyed the disease by feeding pregnant cows upon virulent material passed by infected animals, thus the mouth and alimentary system generally may be viewed as another port of entrance for the virus.

Nocard also called attention to the possibility that infection may take place through the respiratory tract. From this we must conclude that the air passages and lungs form a third possible port of entrance for the virus.

Experimentally, the disease has been transmitted by intravenous injections of virulent material. We can hardly look upon intravenous inoculation as a natural method of infection, but in this connection we may consider wound infection as a possible source of the disease. Yet when we are aware how readily the disease spreads through a herd we can only look upon wound infection as being a probable side issue.

Leaving the latter theory out, we have to consider three possible natural ports of entrance for the virus into the body :—The Vagina : The Alimentary canal : The Respiratory tract.

The Vagina. Until the present day the opinion was held by many that the vaginam formed the more usual port of entrance for the virus. We have seen that experimentally infection per vaginam is a certain method of conveying the disease to a healthy pregnant animal. The point to consider then is by what means the vagina becames infected. As I have already pointed out the uterine exudate, fœtal envelopes, fœtus and vaginal discharges of an infected animal are all virulent, and an infected cow may contaminate the walls, mangers, floor, etc., of the byre, the water in drinking ponds, streams, pastures, etc. If the vulva of a healthy pregnant animal is soiled with these contaminations you then get the external genitals directly infected, and from there the bacilli work their passage to the uterus. The vagina may also become infected through the agency of the bull during coition. It is believed that the disease is not natural to the bull. Knowing that the disease is capable of being transmitted by the bull in this way, and that it is the custom in many parts of the country of utilising a bull for several different herds of cattle in his neighbourhood, we can readily understand how the disease may spread to healthy herds even though there be no new introduction of infected cows. Paulsen, as quoted by Bang, records a case of a herd of 16 cows, seven of which were served by a bull from an infected farm ; all these seven cows subsequently aborted.

The Alimentary System. Nocard, Galtier, Bang, and others conveyed the disease experimentally by feeding healthy pregnant cows on virulent material from cows that had aborted. The fodder, mangers, drinking water, etc., may all be contaminated by the discharge of an infected cow, and a healthy animal grazed or housed with the infected, runs the grave risk of swallowing virulent material with the food stuffs.

If the organism gains entrance into the alimentary canal and ultimately reaches the uterus it must necessarily do so by way of the blood stream.

The Respiratory tract. Nocard first introduced the theory that infection may take through the respiratory system. I have not met with any records of experiments substantiating this theory, but knowing that infection follows ingestion or intravenous injection of virulent material, to my mind the theory of the possibility of infection through the respiratory system is quite feasible. Nevertheless, I agree with the epizootic abortion Committee that infection *usually* takes place by the digestive tract, the bacilli reaching the womb indirectly from the alimentary canal.

Symptoms.

In many cases contagious abortion takes the form of temporary sterility, the animal returning at frequent intervals to the bull. When conception does take place the abortion as a rule occurs from the third to the seventh month. Often a cow aborts without showing any premonitory symptoms, but usually animals about to abort appear uneasy and restless. The milk yield is suddenly decreased, there may be a slight swelling of the lips of the vulva, and a blood-stained muco-purulent vaginal discharge at intervals. In some cases there are marked constitutional disturbances. After the animal aborts the placenta may be retained. Following the expulsion of the fœtus there is a vaginal discharge

which persists for some weeks. For the first and second abortion in the same animal the fœtus as a rule is born dead. In many cases the calf is carried longer each successive year, until it comes to full term, indicating that there is a gradual acquirement of immunity.

Post-mortem appearances. The lesions are confined to the reproductive organs. Within the uterus, between the mucous membrane and the fœtal envelopes, there is a dirty yellow odourless exudate; sometimes the exudate is of a darker colour, more approaching that of chocolate. The exudate is collected particularly around the cotyledons. The sub-chorion of the fœtal envelopes is œdematous. The baccillus of contagious abortion is present in the exudate, the fœtal envelopes, on the skin of fœtus, and in the fluid of the stomach of the fœtus.

Diagnosis.

A positive diagnosis may be made by microscopically examining scrapings from the placental cotyledons, or fluid in the stomach of the fœtus. The vaginal discharge may also be examined in the same way, but in this case you are not likely to find so pure a culture. This method of diagnosis is only available about the time, or after an animal aborts, but as an animal may be infected for a long time before actual abortion takes place, and as there is no previous clinical evidence of the disease, it is important from a prophylactic point of view that we have other and earlier means of diagnosis at our disposal.

The Epizootic Abortion Committee of the Board of Agriculture, in their endeavours to produce an agent capable of diagnosing an infected animal that presents no clinical evidence, experimented along three different lines, viz., (1) The Agglutination test: (2) Fixation of the complement method: (3) The producion of a vaccine (Abortin).

1. They write in reference to the agglutination test in their report. "Although it is not without value in epizootic abortion, the agglutination test cannot be regarded as free from great risk of error." From this we may conclude that at present it is not likely to be of great use to the practitioner in his investigations of the disease in herds.

2. In regard to the "Complement test" they say "It may prove to be reliable for the diagnosis of epizootic abortion even in its early stages." The technique of this test is very complicated, and it is not likely to prove of much value outside the laboratory.

3. Of the three tests experimented with, the abortin test is the one that is likely to prove useful and practicable. Abortin is a material prepared on somewhat similar lines to tuberculin and mallein. Rich growths of the bacilli are obtained by inoculating them in glycerine broth serum and 1% grape sugar, and incubating at 37 C. for four to six weeks. The cultures are then sterilised at 99 C. for two hours, and then filtered to remove the dead bacilli; 1% carbolic acid is added as a preservative. This material (abortin) is injected subcutaneously, the dose being 5 c.c.

Abortin is said to give a temperature reaction in infected animals, commencing the fourth hour after injection and continuing up to the 14th hour. A rise above 104 F. is considered a reaction, and indicative of the animal being infected. The temperature is taken the fourth hour after injection, and at intervals of two hours up to the 14th hour. If the animals are injected at 8 a.m. the first temperature is taken at the time of injection, and the next at 12 noon and every two hours then until 10 p.m.

In conjunction with Mr. J. Malcolm I tested some herds near Birmingham with abortin. On June 14th, 1909, we tested six animals. The abortin was injected subcutaneously at the side of the dew lap. Chart No. 1 shows the result of that test. Among these six, the last No. 6 was the only one that had previously aborted. None of these animals showed a sufficiently high rise in temperature to indicate that they were infected. No. 4 is the only animal which gave any noticeable rise in temperature, though not sufficient to dub her a reacter. We were surprised on hearing from the owner on

No.	Description.	Served.	Previously Aborted.	Initial Temp.	2nd Hour.	4th Hour.	6th Hour.	8th Hour.	10th Hour.	12th Hour.	14th Hr.
1	Blue Roan	Dec. 22	No.	101·2	101·4	101·2	101·2	101	101·2	101	101·2
2	Roan, ¾ udd.	March	No.	101·2	101·2	101	101·2	101·2	101·2	101	101
3	Straw Roan	Feb. 18	No.	101·2	101	101	101	101	101·6	101	101·2
4	Red & White	Jan. 4	No.	101·2	101·2	101·2	103	102·6	103	102·8	101·8
5	Red	Mar. 15	No.	101	101·2	101·4	101·2	101·2	101·8	101·2	101·2
6	Red Welsh	April 6	Yes	100·2	100·4	100·4	101	100·8	101	101	101·2
7	Red	May	Yes	101	101	101	101	101·8	102	102·2	102·2
8	Red	May	No.	100·6	100·4	101·2	101·2	101·4	102	101·6	101·6
9	Roan	April 8	Yes	101	101·2	100·8	101·8	101·6	101·8	102	102·4
10	Red	May 19	No.	101	100·2	101	100·8	101	101	101·6	101·2
11	Red & White	May	No.	100	101·8	100·6	101·2	101·4	101·4	101·4	101 6
12	Roan	April 8	Yes.	101·2	101·2	101·4	102·4	103·4	103·6	103	103·2
13	Roan	May	No.	101·2	102·2	101·6	102·2	102·6	102·6	102·4	102
14	Red	May	No.	101·4	101·2	101·4	101·6	102	101·6	102	102·2
15	Red	May	No.	101·2	101·2	101·6	101·2	101·8	102·8	101·4	101·6
16	Light Roan	April	Yes.	101·4	101·4	100·8	101·6	102	102·8	105·4	105·6
17	Red	May 30	Yes.	100·8	100·6	100·8	102·8	103·2	104·2	104	104
18	Young	April	Yes.	101	100·2	101	101·4	101·8	103	102	101·6
19	Old Dun	June 17									
	Jersey	April 6	No.	101	101·6	101·6	101·8	101·6	101·4	100·8	101
20	Roan	May 14	No.	101	101	101	101·2	101·6	102·4	103	102·6
21	Roan Bull	——	——	101·4	101·4	100·8	101·4	102·2	101·8	102	104
22	White	Not served	No.	100·4	101·6	100·8	101·6	101·6	102	102·4	102
23	Red and White	„	No.	100·8	100·8	100·8	101·6	102	101·8	102	102.2
24	Red	„	No.	102	102	102	104	104·2	104	104	101·2
25	Red	„	No.	100·4	101	101	101·2	101·2	101·4	101·4	104·2
26	Light Roan	„	No.	100	101	101·4	101·2	101·4	101·2	101·6	101·2
27	Red Roan	„	No.	100	101·2	101·8	101·2	102·4	104	102	102
28	Red and White	„	No.	101·4	102·2	101·8	102·4	102·6	102·8	102·2	102·2

August 1st, that No. 4 cow had aborted. This cow was served on January 4th, that is to say she aborted about the 7th month. We forwarded the fœtus and membranes on to the Board of Agricultnre, and later Mr. Malcolm had a reply stating that the fœtus and membranes showed the abortion bacillus.

On June 18th, 1909, we tested 22 animals on the same farm. Chart No. 2 shows the result of that test. On referring to the chart you will see that six of these animals previously aborted, viz.: Nos. 7, 9, 12, 16, 17, and 18. Of these six only three viz: Nos. 12, 16, and 17 gave anything approaching a reaction, and none of the others showed a noticeable increase of temperature except No. 21, a bull, and No. 24 an empty heifer. Of the whole 22 animals No. 16 is the only one that gave what might be considered a reaction. Possibly as these animals were only served a short time previously (most of them about a month) the disease had not developed sufficiently to cause a reaction.

Prophylaxis.

The first and most essential step in the prevention of epizootic abortion is the separation of the infected from the non-infected. As with other contagious diseases, you must begin your eradication by removing your centres of infection—the diseased cows. The process of identifying the diseased cows and of adding new animals to the non-infected herd requires the greatest possible care.

All newly bought cows should be kept in quarantine until they have calved, and if they show any symptoms of epizootic abortion they should not be added to the sound herd. A bull which has never been in connection with an infected farm should be utilised for the healthy herd. Cows should never be sent to a strange bull, and if a new bull is bought the penis and sheath should be thoroughly disinfected before he is allowed to serve any cows.

If a cow shows any premonitory symptoms of abortion she should be removed at once to an isolation stable, which should be kept thoroughly disinfected. When she has aborted the fœtus and fœtal membranes should be burned, or buried surrounded with chloride of lime. The manure and discharge from the animal should be covered with hot lime. The cow should have the uterus irrigated daily for a week with a 2% solution of carbolic, or Hg. Cl_2 1 in 3,000 or other reliable disinfectant. The vulva, tail and hind quarters should be washed with a disinfectant solution. The free herd should not be allowed on the pasture grazed by the infected herd, and if there is a drinking pond, neither herd should be allowed into it.

The attendants on the sound herd should not be allowed in the byres occupied by the infected animals, and *vice versa*, as the virulent material may be conveyed on their boots, clothes, etc.

If abortin prove a reliable diagnostic agent, so that it may be possible to detect latent cases in which no clinical sign of the disease is present, diagnosis will not be difficult, and segregation of the infected from the free can proceed with certainty. Not only should care be taken to prevent the spread of abortion in a herd where it exists, but it is equally necessary that care should be taken to prevent its introduction into a clean herd. Both agriculturists and veterinarians who have had practical experience of the origin of an outbreak agree that almost invariably the disease is introduced into a clean herd by the purchase and bringing it unwittingly of an infected cow. At the present day it is unfortnnately a common practice for farmers who have infected herds to cast for sale cows that have recently aborted and those that are suspected of being likely to abort, and many farmers fail to perceive that in doing this they are doing anything reprehensible. I asked one farmer who told me of his having followed this practice, what he would think of anyone knowingly selling him infected cows if his herd were clean. "Ah! he said, I did not think of that, I shan't sell one again." Another reputably well-to-do farmer, in writing to enquire about abortion said, "that that morning he had a cow which he suspected was about to abort, so he had at once sent her off for sale. While such practice continues to be followed and is not illegal, any diminution in the prevalence of abortion—far less its eradication—need not be looked for. But the knowledge that it does exist should be remembered by every buyer of cows. It behoves those who have clean herds to buy cows that come from guaranteed clean herds, and if they buy at public sales they should observe carefully the incontact cows with which the cows they propose buying are associated, with a view to detecting any evidence or sign of such having aborted.

There are many pitfalls open to purchasers of milch cows in public markets. When a cow aborts many farmers, with a view to freeing their herds of abortion, immediately send the offending cows to the market accompanied by full time calves. This practice of "swapping" calves renders the case all the more difficult of detection by clinical methods. If the calf is described as two or threee days old, the cow's milk then should be at the beestings (colostrum) stage. If the calf is entered as a fortnight old, then the cow should be heavy in milk. Thus from the nature and quantity of milk given, one may roughly judge the veracity of the catalogue description.

Carbolic Acid. For many years the internal administration of carbolic acid has been boomed as a reliable preventative, but as far as I know there is no substantial evidence to guarantee this reputation. Probably its apparent success depended mainly on that tolerance to the bacilli which infected cows acquire after the second or third abortion.

Acquired Immunity. As a rule cows acquire immunity after the second or third abortion. According to Penberthy, in the case of repeated abortion in the same cow, the calf is carried longer each successive year until it comes to its full term. Bang refers to a herd of 200, of which 83 aborted in their first pregnancy, and of these only 20 aborted in their second, and seven were barren.

In this herd over two-thirds of the cows that aborted in their first gestation carried the calf to full time the following year.

Cows that have actually acquired immunity, although they do not themselves abort, are capable of transmitting the disease to others. Though the bacilli have lost the power to cause abortion in that particular individual, yet they may be still living in the genital passages of a naturally immunised animal. An infected animal that has become tolerant to the bacilli, can, with safety to itself, carry a living organism that readily infects a healthy animal. An apparently healthy cow may thus prove a dangerous centre of infection in the herd.

Immunisation Experiments.

Bang in 1903 and 1906 carried out experiments on sheep, goats, and cattle with a view to immunising them against abortion. He injected animals intravenously with living bacilli before they became pregnant, and when the animals became pregnant he fed them with cultures or virulent material from aborted cows to cause infection. Later he tried subcutaneous injection of culture for vaccination, and he considered the intravenous injections dangerous. As a result of his experiments, Bang considered subcutaneous injections of cultures of living bacilli as a more hopeful method of vaccination against contagious abortion than any other method he had tried. He found that injections with cultures of dead bacilli had not been able to produce immunity against a strong feeding infection, but cultures of living bacilli injected subcutaneously has protected all his experimental animals, goats and sheep.

The Epizootic Abortion Committee have carried out a series of immunisation experiments. They aimed at producing immunity by subcutaneous injections of large doses of pure cultures of the bacilli. At first they experimented with sheep, but the results were considered irregular and not very encouraging. They then experimented on heifers, both in the laboratory and in different parts of the country. They injected non-pregnant animals with cultures of living bacilli, the dose being 150 c.c. Their experiments with heifers produced more hopeful results than those carried out with ewes.

In one experiment at the laboratory they injected 125 c.c. of a culture rich in living bacilli. 147 days later the heifer was served by the bull and became pregnant. 40 days later she was inoculated intravenously with 10 c.c. of an emulsion of virulent uterine exudate. This heifer was slaughtered 112 days later and she was found free from the disease. In this case the animal must have acquired, when non-pregnant, a high degree of immunity with the first injection of 125 c.c. of the culture.

At a farm near Birmingham where between 50 and 60 milking cows are kept the owner had the greatest difficulty in getting his cows in calf. From January to July, 1909, his cows were constantly returning to the bull. There was a certain degree of temporary sterility among his cows. Fifty-two cows were not pregnant after the first service. Most of his cows were served three times by the bull, and in some cases four times. On March 26th, 1909, one cow aborted, and later up to July he had five other abortions in his herd. This cow-keeper sold for slaughter the six cows that aborted.

On August 5th we tested with abortin 44 animals at this farm, and it was decided to inject the anti-abortin.

On September 30th, in conjunction with Mr. Malcolm, I injected 29 animals on this farm with cultures of living bacilli (anti-abortin) obtained from Mr. Stockman. They were all non-pregnant animals; injected in front of the shoulder; dose 150 c.c. After injection the point was well massaged for two or three minutes.

From September 30th up to February 25th there were four abortions in the herd among the animals that had not been injected with anti-abortin. Since then up to the time of writing there has not been another case either among the immunised or non-immunised animals, and the cows do not now return to the bull as formerly.

Great attention was paid from the beginning to cleanliness, disinfection and isolation of all suspected animals. The sheds were always kept thoroughly cleaned, the cows were closely watched daily, and any of them that showed the slightest symptom of abortion were isolated at once. The isolation box was always kept well disinfected, and the vaginal discharges or anything likely to spread the disease was always covered in quicklime. When a cow aborted the uterus was washed out with disinfectant. There were two bulls kept, and if a cow failed with one, the other served her later. Any cows that aborted were not returned to the bull, but were fed and sold for slaughter. It is now eight months since there has been a case of abortion in this herd, and I consider the hygienic measures adopted, combined with the immunisation with anti-abortin has completely rid this herd of the disease.

Curative Treatment.

We have very little reliable evidence available of the value of any line of curative treatment. Carbolic acid has received a certain amount of empirical laudation as a curative, but so far as I know this is not based on any reliable data. Indeed it is difficult to conceive how this could exert a curative effect, since we know that in the body carbolic acid is converted into the inert substance sulphophenic acid. The Committee's experiments, so far as they go, seem conclusive that any apparent curative effect that may follow the administration of carbolic acid was due to some other factor, and not to the acid. They submitted a number of abortion infected heifers to carbolic acid treatment, administering the acid alternately by mouth and by subcutaneous inoculation. The results were negative in one or two instances, in others they conclusively showed that carbolic acid had no curative action. I may cite one case here of the latter. Heifer 188 was experimentally infected with virulent abortion material 43 days after becoming pregnant. Thirty days after infection she received every other day 2dr. carbolic acid in mash, alternated every fortnight by subcutaneous injection of 1dr. carbolic acid in glycerine and water every other day. She aborted 102 days after infection and in the 10th week of treatment.

I think we may conclude that if carbolic acid were given in sufficient doses to kill the abortion bacilli it would kill the subject. I notice in the October number of *Veterinary Notes*, issued by Parke, Davis, and Co., that they suggest Acitozone or solution of H_2O_2 as a remedy.

Serum Treatment. For some time, I am informed, the Dutch Government from their Rotterdam Institute have been issuing a serum as a curative for abortion. But on what grounds they do so I am unable to conceive. I have heard that in 1908 they obtained cultures of the abortion bacillus from which they started to prepare a serum. This is given to farmers free, and its use has been credited with beneficial effects chiefly, probably, because there seems to be an increasing demand for it. But so far as I know there are no available data to measure the effect. Personally, I am not inclined to place any faith in it.

Vaccine Treatment. I cannot say much about this personally, but if anyone here has used either in the field I hope you will give us your experience.

Legislative Measures.

There is no law or legislative measure of any sort to prevent owners from exposing infected cattle in open markets, highways, etc. We are all aware that Epizootic abortion must cause a great loss annually in this country, and stock-owners and others may reasonably call upon the Government to introduce legislative measures which are calculated to reduce if not stamp out this scourge.

I understand that Norway has scheduled epizootic abortion among the milder contagious diseases. They prohibit infected cattle from open markets. Owing to the short time at my disposal since our President, Mr. Gold, asked me to prepare this paper I have been unable to get any information as to the success or otherwise of the legislative measures in that country,

With our insular position in this country, and given such weapons in the hands of veterinary surgeons as "Abortin," "Anti-abortin," and an efficient Board of Agriculture Order, I think that the disease should follow the road of Cattle Plague, Foot-and-mouth Disease, and Pleuro-pneumonia. Legislative measures introduced should be such as give reasonable hope of securing eradication of the disease.

In the second report of the Epizootic Committee they state as follows:—

Public Control or State intervention with a view to prevention of a contagious disease appears to be justified when:

(1) It is recognised that private or individual effort as a means of combating the disease is from the nature of the case inadequate.

(2) Knowledge regarding the disease has reached such a point that it is possible to devise regulations which are likely to prove effectual if enforced by law.

(3) The weight of opinion amongst those whose interests are affected by the disease is in favour of State control.

(4) The loss occasioned by the disease when uncontrolled exceeds the probable cost of the measures required to counteract it.

Later in their report they further recommend that as

a preliminary measure, Epizootic Abortion in cattle should be dealt with under an Order of the Board of Agriculture and Fisheries requiring:

(1) Compulsory notification of suspected cases.

(2) Veterinary enquiry to establish the existence of disease on any particular premises, and:

(3) Temporary isolation, and restrictions on the movement of any cow that has recently aborted.

We sincerely trust the Board will not pigeon-hole the Committee's most valuable report, but will schedule Epizootic Abortion of cattle as a contagious disease and give effect to the Committee's recommendations, which, if put in force and efficiently administered, should soon make an appreciable impression in diminishing the prevalence of the disease.

In conclusion, I here desire to acknowledge my great indebtedness to Mr. Stockman for his courtesy and kindness in supplying me with a copy of the Second Report of the Committee, together with sample of uterine exudate from an infected cow: A slant culture of the abortion bacillus on agar: A micro-photograph of the bacillus: A microscopic slide showing the bacillus.

Gentlemen, I thank you for your courteous hearing, and I hope to learn much from the discussion.

At the conclusion of the paper the President said that having regard to the importance of the subject and the very little time they had at their disposal, the better plan in his opinion would be to adjourn the discussion till the next meeting. The paper in the meantime might be printed and circulated amongst the members, who would be able to do it greater justice after a quiet and careful study of its contents. (Hear, hear.) Moreover, it would be a slight upon Mr. DeVine, who had displayed great skill and ability in the preparation of the paper, if the discussion were scamped in any way, which must necessarily happen if they undertook it at once. He might say, also, that the Board of Agriculture were desirous of obtaining an expression of opinion from this Association, as well as from other similar bodies, on this very subject, with a view to the introduction of legislation dealing with it. That, he considered, was another reason why the discussion should be careful and deliberate. (App.)

Mr. GIBBINGS agreed that if they had time to digest the subject, the discussion would be more profitable than if they took it up now in a comparatively small meeting.

Mr. WARTNABY spoke in similar terms.

It was moved by the President and seconded by Mr. Smith that the discussion be adjourned till the next meeting and that in the meantime the paper be printed and circulated among the members. This was unanimously agreed to.

VOTE OF THANKS.

The HON. SEC. proposed that the best thanks of the Association be tendered to Mr. DeVine for the time and trouble he had given to the writing of the paper. The experiments, the results of which had been laid before them that afternoon, must have involved no little patience as well as time. They had been furnished with a practical proof of what many of them already knew, namely, that Mr. DeVine was an earnest student of every question affecting his profession, and the City of Birmingham was fortunate in having at the head of its veterinary department such talented men as Mr. Malcolm and Mr. DeVine (Applause).

Mr. BROOKE seconded, and said Mr. DeVine had shown himself to be an authority on a subject that was of the utmost importance to every practitioner (applause). The vote of thanks was heartily carried.

Mr. DEVINE said, in reply, that he was very much obliged by the kind way in which his paper had been received, also for the all too flattering remarks that had been made concerning him. It was quite true that he was interested in the subject, and he should look forward to a good discussion at the next meeting.

The members took tea together before separating.

H. J. DAWES, F.R.C.V.S., Hon. Sec.

DISEASES OF ANIMALS ACTS 1894 TO 1903, SUMMARY OF RETURNS.

Period.	Anthrax.		Foot-and-Mouth Disease.		Glanders (including Farcy)		Counties Affected	Sheep Scab.	Swine Fever.	
	Out-breaks	Animals.	Out-breaks	Animals.	Out-breaks	Animals.	Animals Attacked	Out-breaks	Out-breaks.	Slaughtered. *
GT. BRITAIN. Week ended Nov. 12	30	34			3	4	Essex 1	11	25	229
Corresponding week in 1909 ...	20	22			8	15		16	23	116
Corresponding week in 1908 ...	25	30			16	58	Kent 1	23	53	350
Corresponding week in 1907 ...	15	21			22	40		16	28	170
Total for 46 weeks, 1910	1287	1536	2	15	327	950	London 1 Surrey 1	385	1317	12251
Corresponding period in 1909 ...	1145	1493			482	1651		526	1483	13233
Corresponding period in 1908 ...	972	1267	3	112	719	2248		701	1856	11723
Corresponding period in 1907 ...	954	1278			769	1750		481	2167	10417

Board of Agriculture and Fisheries, Nov. 15 1910.

	Parasitic Mange (outbreaks)									
IRELAND. Week ended Nov. 5	...	...	...	...	...	...	1	4	1	34
Corresponding Week in 1909 ...	...	...	...	...	...	...	...	5	...	...
Corresponding Week in 1908 ...	...	...	...	...	...	...	1	9	1	1
Corresponding Week in 1907 ...	...	...	...	...	...	...	...	6	1	109
Total for 45 weeks, 1910 ...	7	11	...	...	1	2	63	391	88	1903
Corresponding period in 1909 ...	8	8	...	...	...	...	70	335	86	1561
Corresponding period in 1908 ...	7	10	...	...	...	...	35	302	153	3535
Corresponding period in 1907 ...	3	5	...	...	5	9	72	218	140	2523

Department of Agriculture and Technical Instruction for Ireland, (Veterinary Branch), Dublin, Nov. 9, 1910

NOTE.—The figures for the Current Year are approximate only.

* As Diseased or Exposed to Infection

ROBERT CADWALLADER TRIGGER, J.P., F.R.C.V.S.,

PRESIDENT R.C.V.S. 1897,

MAYOR OF NEWCASTLE-UNDER-LYME, STAFFORDSHIRE